A Military Training Perspective - Technology and Trends

Andy Fawkes
FIMechE
My Background
Presentation Overview

• Context (Some Statistics)
• Military Training Basics
• A Very Short History of Military Training Technology
• Current Military Training Examples
• Military Training Challenges and Opportunities
Context (some statistics)
Total World Military Expenditure
$1.69 trillion (2016)

1. USA - $611bn
2. China - $219bn
3. Russia - $69bn

Stockholm International Peace Research Institute (SIPRI)
Military Training & Education Expenditure - %Total

~20%

- Manpower
- Platforms and Equipment
- Fuel and Maintenance
- Training Estate and Establishments
- Training Systems and Simulators
Global Military Numbers – 56.7m

Global Military Numbers (Total 56.7m)

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th>Active + Reserve</th>
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<tbody>
<tr>
<td>1 China</td>
<td>2,183,000</td>
<td>8,130,000</td>
</tr>
<tr>
<td>2 India</td>
<td>1,395,100</td>
<td>7,490,000</td>
</tr>
<tr>
<td>3 United States</td>
<td>1,347,300</td>
<td>5,482,000</td>
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Stockholm International Peace Research Institute (SIPRI)
UK Military Trends

2016/17 Intake
(total strength - 138,351)

- Army - 8,294
- RAF - 2,044
- RN - 3,045
Military Demographics (US Active Duty, 2015)

- 44% - Age 25 or younger
- 91% - Age 40 or younger
- 28.5 years - Average Age
Military Demographics (US Active Duty, 2015)

- Total Number: 1.3m
  - 82.3% Enlisted
  - 17.7% Officers
  - 15% Female (n=201,413)
    - 15.5%
  - Male (n=1,100,030)
    - 84.5%
Military Demographics (US Active Duty, 2015)

- 21% - Bachelor Degree or Higher
  - 84% - Officers
  - 7% - Enlisted
  - (28% - US Adults 18-44yrs)
Military Geographic Location (US Active Duty, 2015)
Military Training Basics
The Global Security Context

• The world in a process of rapid & fundamental change
• Long-term shifts in the balance of global economic & military power
• Emergence of powerful non-state actors
• Predictable and unpredictable threats
• Rapid civil technology developments & escalating cyber threat
• Increasingly congested and complex world
• War is chaotic
• No battle plan withstands contact with the enemy
• “All but war is simulation”
• “Train as you Fight”
UK Royal Navy Training

• “are we ready to fight tonight?”

• “are we prepared to fight tomorrow?”
Nations Train Differently

- National and Military Culture
- Appetite for Risk
- Operational Tempo
- Equipment
- Training Methodology and Technology
- Resources
- Allies and Enemies
Specialist Training
Team Training
Collective Training and Exercises
Coalition Training and Exercises
Military Knowledge and Skills

Depth

Breadth

Flexibility
Example – Nuclear Submarine
How do the Military Achieve this Level of Training and Education?

- The Military understands that training and education is fundamental to their endeavour
- People are assessed by how well they do in training
- Career progression depends on training and education
- Peer pressure
- Much of military life is spent training and exercising
- Lessons learnt are fed back
A Very Short History of Military Training Technology
Oldest Surviving European Training Media

Franconian Fechtbuch
(Combat Manual)
~1300
WWI Flight Simulation
“Academic instruction is not sufficient; the learner should have **ample practice.**

- **Brief lectures** giving the fundamental theory.... much better than long, intensive discussions which tire the minds of the listeners and cause a loss of interest.

- ...instruction centers on the use of a single gun, whereas in actual practice the twin gun is universally used. This **discrepancy between instruction and practice** should not occur.”
1970s Flight Simulation
It worked, but...

• Inflexible - Scenarios and Training

• Expensive and High Maintenance
UK Dismounted Infantry Virtual Environment (2002)
When to use Games in Training?

• Games effective for cognitive or “how to think” training

• Games are not typically used to train motor skills, e.g. shooting a rifle or stomping around in the mud
Games-Based Simulation Now - Land, Sea, Air, Anywhere
Consumer Technology
Military Access to Simulation

Numbers

10’s  100’s  1,000’s

1990  2000  2010  2020
Digital Media Consumption
E-Learning
Current Military Training Examples
Fast Jet Training at RAF Valley (UK)
Swedish Air Force – Shift to Competence Based Learning

- Learning outcome focus rather than on course timetable
- Caters for greater diversity of skills and experience
- More risk (lack of repetition)
- Relies on very high-quality instructors
Changing Technology and Training Needs

Panavia Tornado (1970s on)
• Analogue
• Knobs, Dials

Lockheed Martin F-35 (2010s on)
• Digital
• “Glass Cockpit” - Touch Screen
UK Unit Based Virtual Training - Training as a Mobile Service

• Mobile contracted service supporting every Regular unit in the British Army
• Capacity of 10,950 trainees per annum – 73 units ~150 soldiers and officers
• Responds to unit demand but also collects and spreads best practice as it goes around the units
• Exploits gaming technology
Maritime Operations Room Training
Maritime Composite Training System
Maritime Firefighting and Damage Control Training

On-Shore Royal Navy Firefighting Training

• > 12,500 students trained every year
• 20 year contract worth £150m

Damage Repair and Instructional Unit (DRIU)
Military Networked Simulator Training
(Geographically Distributed or Co-Located)

High Level Architecture
HLA or DIS
USAF Distributed Mission Operations Network (DMON)

- DMON allows different aircraft simulator platforms located across the globe to interoperate and train together in a realistic virtual environment via a secure network.

- Provides on-demand, inter-team training for the Combat Air Forces on a daily basis.
Live-Virtual-Constructive Infrastructure
Deployable Training Devices –
US Army Aviation Combined Arms Tactical Trainer (AVCATT)
Live/Simulation Balance

**Live Training**
- Fear
- Friction
- Fog of War
- Real Comms
- Build Muscle Memory
- Real Weather & Terrain Effects

**Simulation-Based Training**
- Flexible and Deployable
- Repeatable
- Safe
- Fully Instrumented
- Less Cost and Equipment
- Less Environmental Impact
Maintenance and Support Training
UK Defence Learning Management Capability

• 200,000 Defence Learning Environment Users
• 15,000 different course types
• Training at Home, Home Station, Deployed, and at Sea on most end-user devices
• A digitised, coherent, learning and training environment that accurately records achievement, ongoing needs, and development opportunities
Military Training Challenges and Opportunities
Changing Demographics

Television Shortcuts

A dying habit: why the average BBC1 viewer is 61

Simon Usborne

Wednesday 29 March 2017 17.38 BST

Old medium ... has TV lost its appeal to young people? Photograph: simonkr/Getty Images/iStockphoto
What’s Next?

Digital Native

AI Native?
Train and Retain the Trainer?
Technology Now – Choices, Choices...
Where to Invest?

More e-Learning for all?  
or  
A more expensive Simulator for a few?
Training Requirements

- There are processes to determine training requirements, eg. Training Needs Analysis, however:
  - Conducted early in project lifetime
  - Irregularly reviewed and typically qualitative evidence

Regular quantitative feedback
Training Providers - Innovation v Stability?

- Adaptability
- Responsiveness
- Technology Exploitation

- Investment
- Stability of Supply
- Stability for Trainers
Striving for Training System Interoperability

Challenges
• Project Priorities v Enterprise Priorities
• Different Vendors
• Different Timescales
• Different Technology

Response
• Standards Bodies
  – Simulation Interoperability Standards Organization
  – NATO Modeling & Simulation Group
The Rise of Military Autonomous Systems

US Navy X-47B
US AFRL “ALPHA”
US Army Manned-Unmanned Teaming (MUM-T)
US Navy Autonomous Craft
Unity Games Engine
Machine Learning Agents
(Sep 2017)

Simulation/Games being used to “train” AI Programs
Quantified Human
A Fourth Revolution - Training 4.0 (?)

1st

Paper, Chalk

2nd

Paper, Electro-Mechanical

3rd

Digital Media

4th

Digitisation of Training
Islands of Training Data
What can we Learn from Massively Multiplayer Online Games? (MMOGs) in a Defence Context?

• MMOGs offer a new way of thinking for Defence about persistency of training and simulation data and user community support

• A defence MMOG approach would bring benefits to trainees, trainers, analysts and the enterprise, driving cost effectiveness and improving flexibility
## Some Benefits of a MMOG-Based Approach

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<th><strong>Trainee</strong></th>
<th><strong>Trainer</strong></th>
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<td>• Performance measured and recorded, accessible through career</td>
<td>• Access to a training and education environment 24/7, maintained and updated centrally</td>
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<td>• Training content and other trainees easy to discover and share knowledge with</td>
<td>• Training scenarios easy to access, develop and share</td>
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### Training Analyst

• Training and human factor analysts collect training data and can conduct analysis on:
  • human performance and training systems effectiveness, and
  • methodologies/pedagogies

### Enterprise

• Software and data maintained and upgraded centrally reducing costs and responding better to changing operational needs
A More Data-Driven Analytical Approach to Training?
making an impact?
Questions?